Supporting information

Self-decoration of Pt metal particles on TiO_2 nanotubes used for highly efficient photocatalytic H_2 production

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Experimental details

For nanotube layer fabrication, Ti sheets (99.6% purity, Advent Materials, UK) of 0.125 mm thickness and 0.2 at% Pt containing Ti alloy (Hauner Metallische Werkstoffe, Germany) were used. Prior to anodization, samples were mechanically ground by 4000 grit size of SiC paper and polished with 9 μm polycrystalline diamond suspension and with a mixture composed of a non-crystallizing colloidal silica polishing suspension and H_2O_2 (90:10 vol%). Afterwards the samples were degreased by sonication in acetone, ethanol, and isopropanol, followed by rinsing with deionized water; finally the samples were dried with nitrogen gas. The anodization was performed in ethylene glycol containing 0.2 M HF at 120 V for 2 h. Anodization was carried out in a two-electrode system using power supply (LAB/SM1300). After the anodization process, the samples were washed in ethanol and then dried in a nitrogen stream. To fully crystallize the materials, all samples were annealed at 450 ^oC for 1 h in a furnace.

For morphological characterization, a field-emission scanning electron microscope (FE-SEM, Hitachi SEM FE 4800) and high-resolution transmittance electron microscope (HR-TEM, Philips CM300) were used. The composition and chemical state were characterized by X-ray photoelectron spectroscopy (XPS, PHI 5600, US).

For photocatalytic H_2 production, the samples were immersed in a quartz tube containing methanol solution that was previously purged with N_2 for 30 min to remove O_2. After purging the 20 vol% of methanol solution in N_2, visible and UV light was irradiated on the samples. The visible light was provided by AM 1.5 solar simulator (300 W Xe, Solarlight) with/without 400 nm cut-off filter. The UV light was provided by HeCd laser (I_{light} = 60 mW/cm^2, λ= 325 nm, Kimmon, Japan). In order to measure H_2 production from methanol solution, gas samples were analyzed by gas chromatography (GCMS-QO2010SE, SHIMADZU).

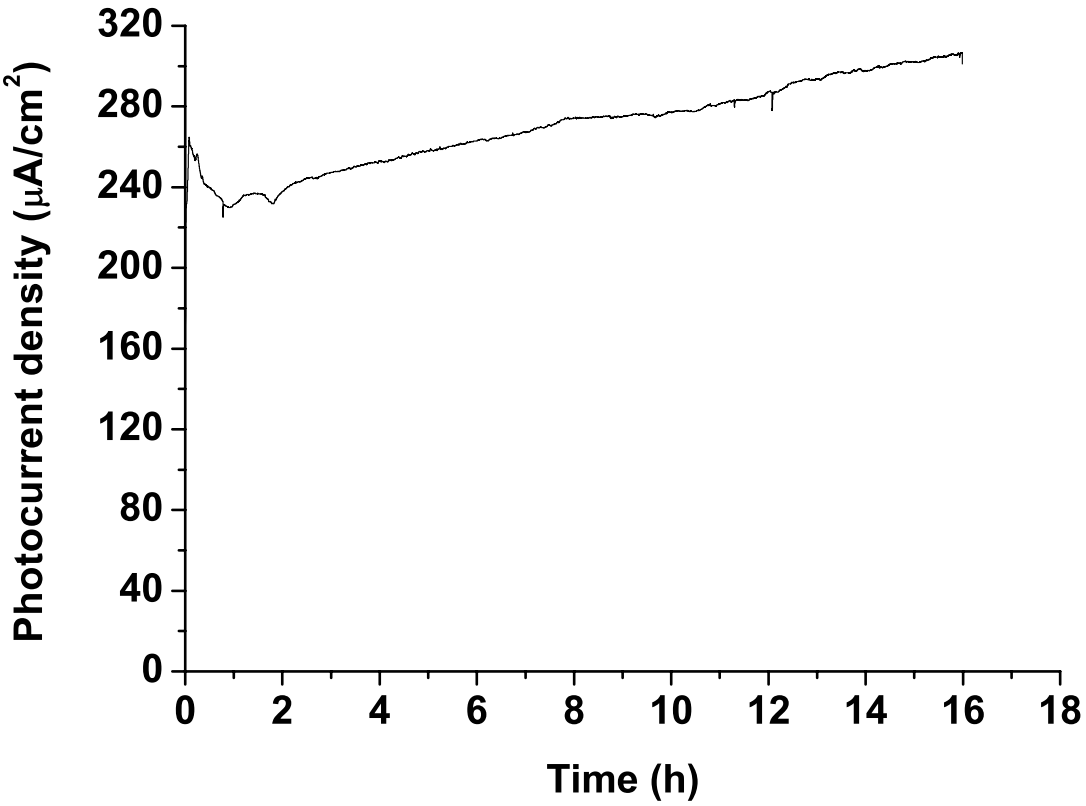

Fig. S1. Photocurrent density of self-decorated Pt on TiO_2 nanotubes in 20 vol% methanol containing water solution at OCV. Pt decorated TiO_2 nanotubes were formed on Ti 0.2 at%Pt alloy.